Lightning and surge protection for intelligent transformer substations

White Paper

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White Paper

Initial situation

The fundamental changes in power supply networks in terms of power fed in from multiple, volatile decentralised sources and the resulting varying load flows and increasing voltage fluctuations, as well as the deterioration of existing grid structures require measures that ensure the security of supply and the stability and availability of the grid. To achieve this, there are a variety of approaches. Since conventional ("copper-based") grid expansion is often extremely expensive, an economic and comprehensive solution must be found by mixing different modular expansions. This can, for example, be achieved by integrating "intelligent" technologies such as monitoring or telecontrol systems, longitudinal voltage controllers, regulated distribution transformers or adapted overall concepts in intelligent transformer substations. All "intelligent" components have one thing in common: The sensitive "smart" electronics must be protected from lightning strikes, surges and electromagnetic interference. This applies to all electrically conductive systems, i.e. to power supply systems and information and communication technology.

Transformer substations are the most important link between medium and low voltage. Year by year these are being replaced, modernised or newly built so that the number of "intelligent" electronic systems in the power grid is constantly increasing. The term "intelligent" transformer substation is used when components like

- monitoring and telecontrol systems / telecommunication systems
- regulated distribution transformers and longitudinal voltage controllers
- communication and control devices
- remotely controlled switch disconnectors / circuit breakers at the medium-voltage level, etc.

are installed. The information gained with the help of these core components not only shows the voltage conditions in the low-voltage system, but also allows one to react immediately to deviations, thus ensuring increased grid utilisation and stability. Due to the increasing complexity and quantity of "intelligent" electronic systems in the energy landscape, the probability that electronic equipment is damaged by lightning strikes and surges or electromagnetic interference is also on the increase. This is due to the

- increasingly wide introduction of electronic devices and systems,
- decreasing signal level and the resulting sensitivity and
- constantly growing, large-scale networks.

Although the trail of destruction left on the electronic components themselves is often quite unspectacular, it frequently leads to long operational interruptions. The cost of consequential damage and liability issues may be considerably higher than the actual damage to the hardware. A comprehensive complete lightning and surge protection system is required to safeguard the high availability and safe and trouble-free operation of the secondary and transmission technology mentioned above.

Risk analysis

Electronic components may suffer damage, experience disturbances or even be completely destroyed for a number of reasons, ranging from direct and indirect lightning effects to surges caused by switching operations, earth faults, short-circuits or the tripping of fuses (SEMP = Switching Electromagnetic Pulse). According to the IEC 62305-2 standard, the causes of lightning strikes are subdivided into four groups depending on the point of strike:

- Direct lightning strike to a structure
- Lightning strike near a structure
- Direct lightning strike to an incoming line
- Lightning strike near an incoming line

Conducted interference pulses can enter the transformer substation via the high-voltage and low-voltage side. This is not simply a theoretical observation based on the geometric factors of a medium-voltage overhead line in combination with the earth flash density, it is corroborated by the practical experience of network operators which shows that up to six direct lightning strikes hit an overhead line network of 100 kilometres in Germany every year.
Interference pulses can also be injected via two-wired communication interfaces in case of a direct lightning strike to the relevant conductor system or a nearby lightning strike close to the relevant conductor system. **Figure 1** shows the different causes of surges.

The danger zone around the point of strike and the resulting destructive effects can extend to more than 2 km. Network operators have many years of experience concerning the actual thunderstorm activity in the relevant supply area. Reference values for the flash densities, which vary from region to region, can also be found on the lightning density map in Supplement 1 of the German DIN VDE 0185-305-2. Due to their small size, the risk of a direct lightning strike to enclosed transformer substations is low. This means that nearby and remote lightning strikes are statistically the most likely and therefore the most frequent type of lightning strike. A case-by-case evaluation is required for large or isolated substations in exposed locations. If the above-mentioned technologies are analysed according to these criteria in conjunction with practical experiences, a

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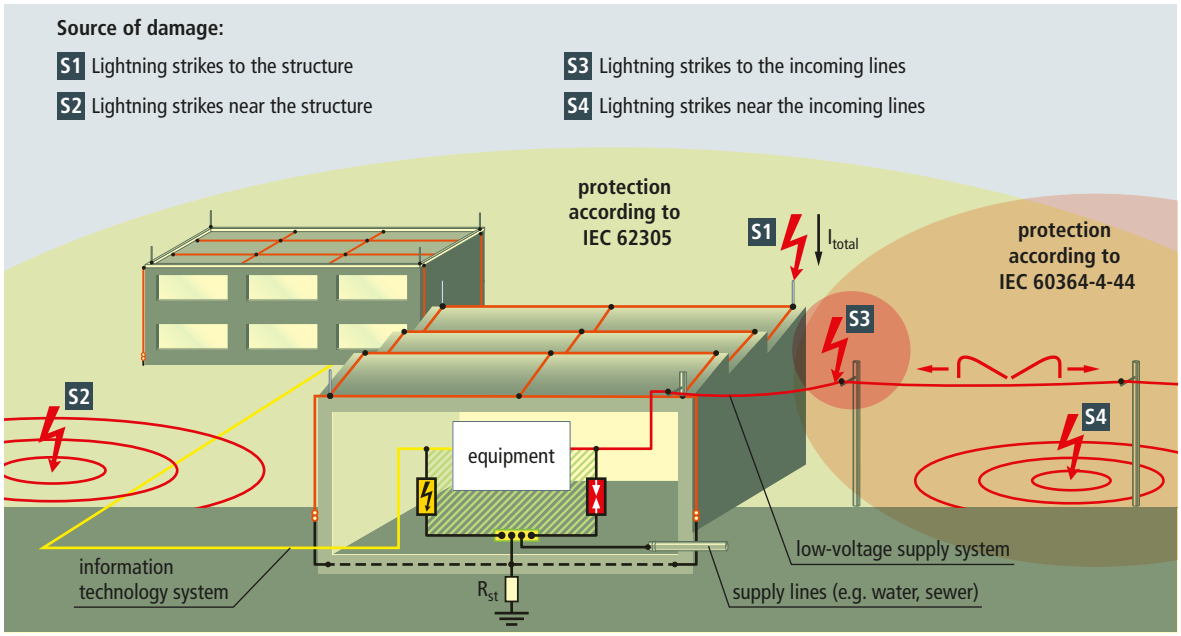

Figure 1 Possible causes of surges

risk analysis will lead to different results depending on, e.g. the local thunderstorm activity, design and place of installation.

Standardisation

The standards of the IEC 62305 series serve as the basis for the protection concept. To minimise damage caused by lightning effects, the following solution approaches can be derived from the relevant protection standards:

- According to IEC 62305-2, the overall risk of lightning damage consists of the frequency of a lightning strike, the probability of damage and the loss factor.
- A conventional lightning protection system (LPS) according to IEC 62305-3 minimises material damage and life hazard in case of direct lightning strikes to a structure.
- To protect structures with electrical and electronic systems, particularly if high requirements are placed on the operational reliability and security of supply, these systems must be additionally protected against conducted and radiated interference which is caused by the lightning electromagnetic pulse (LEMP) resulting from direct and indirect lightning strikes. This can be achieved by a LEMP protection system according to IEC 62305-4. To ensure a consistent and functioning surge protection concept, the arrester types must be energy-coordinated according to IEC 62305-4.

In addition to IEC 60364-1, the IEC 60364-4-44 standard describes the protection of electrical installations from surges caused by atmospheric discharges or switching operations which are transferred via the power supply system. The standard deals with surges caused by lightning strikes near the supply lines and direct lightning strikes to the supply line. Surge protective devices must also be installed in buildings without an external lightning protection system if consequences are to be expected for, e.g., public institutions as well as commercial and industrial activities.

Protection measures

A complete lightning protection (LP) concept for an intelligent transformer substation comprises a lightning protection system (LPS) including equipotential bonding and surge protection measures (SPM) for protecting the electrical and electronic installations. To plan protection measures, it is advisable to divide the intelligent transformer substation into lightning protection zones (LPZs). The following will describe lightning and surge protection measures for electrical and electronic devices / systems / secondary technology of an intelligent transformer substation.

Lightning protection zone concept

The lightning protection zone concept is a structuring measure for creating a defined EMC (electromagnetic compatibility) environment in an object. This defined EMC environment depends on the immunity of the electrical equipment used. The lightning protection zone concept allows conducted and field-bound interference at the boundaries to be reduced to defined values. For this reason, the object to be protected is

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divided into protection zones. The rolling sphere method is used to determine LPZ 0_A, namely the parts which may be exposed to a direct lightning strike, and LPZ 0_B, namely the parts which are protected from direct lightning strikes by, e.g., external air-termination systems. **Figures 2a and b** show the basic use of the rolling sphere method for two different scenarios (exposed/not exposed). In this context, the division into lightning protection zones depends on the design of the intelligent transformer substation, so one should consider its structure. However, what is decisive is that the lightning parameters which are injected into LPZ 0_A from the outside are reduced using suitable shielding measures and surge protective devices at all zone boundaries so that the electrical and electronic devices/systems/secondary technology inside a transformer substation can operate smoothly and without interruption.

External lightning protection measures

An external lightning protection system includes air-termination systems, down conductors and an earth-termination system. The latter is particularly important for a transformer substation. Air-termination systems and down conductors, in contrast, are used for transformer substations in, for example, exposed locations or for large substations since compared to indirect lightning strikes (conducted partial lightning currents, inductive/capacitive coupling) or surges (SEMP)) a direct lightning strike is more likely to occur in rural areas than in built-up areas.

A modular design of transformer substations with arresters, which are ideally integrated in the reinforcement, and appropriate fixed earthing terminals/clamps offers considerable advantages. Depending on the place of installation, very little effort is then required to equip these transformer substations. All in all, the external lightning protection system has the task of intercepting direct lightning strikes and conducting the lightning current from the point of strike to earth. It is also used to distribute the lightning current in the ground over a wide area without causing thermal or mechanical damage or dangerous sparking which may lead to fire or explosion and put people at risk. The rolling sphere method can be used to determine potential points of strike for a transformer substation (**Figures 2a and b**). To this end, a rolling sphere with a certain radius (depending on the class of LPS) is rolled over the transformer substation. Air-termination systems are required at all potential points of strike, i.e. where the sphere touches the transformer substation.

Isolated air-termination system/down conductor

An isolated air-termination system is also required if, for example, external antennas are used. This prevents parts of the antenna system from being damaged by direct lightning strikes. It also ensures that no partial lightning currents enter the transformer substation via the antenna cable. Isolated air-termination systems must be correctly and reasonably dimensioned.

As a basic rule, it must be ensured that the down conductor can withstand the loads and that the transformer substation has been designed for this purpose. A Faraday Cage provides additional reinforcement. Here too, one must ensure that the additional conductors in the Faraday Cage are arranged in such a way that they can withstand the lightning current which may flow through them. Alternatively, the down conductors can also be mounted to the outside of the transformer substation.

Earth-termination system

Earth-termination systems are vital for a functioning power supply (**Figure 3**). The main tasks of a properly functioning earth-termination are to form high-voltage protection and low-voltage ground, to provide protection and limit the voltage to permissible maximum values even in case of a fault, to form the basis for all equipotential bonding and lightning protection measures and to ensure personal and equipment protection. Nevertheless, experiences with and discussions

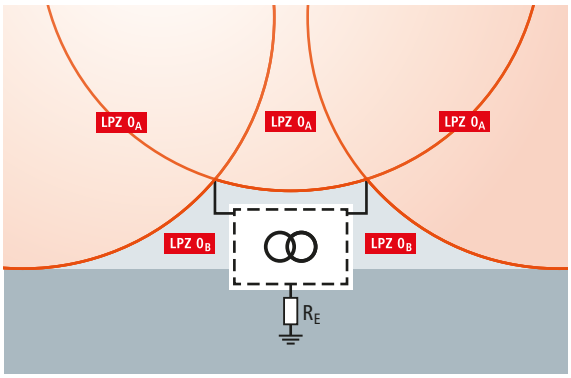

Figure 2a Rolling sphere method used for a transformer substation with air-termination rods in an exposed location

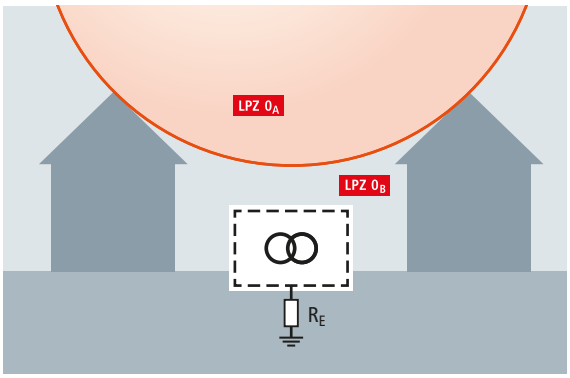

Figure 2b Rolling sphere method used for an enclosed transformer substation

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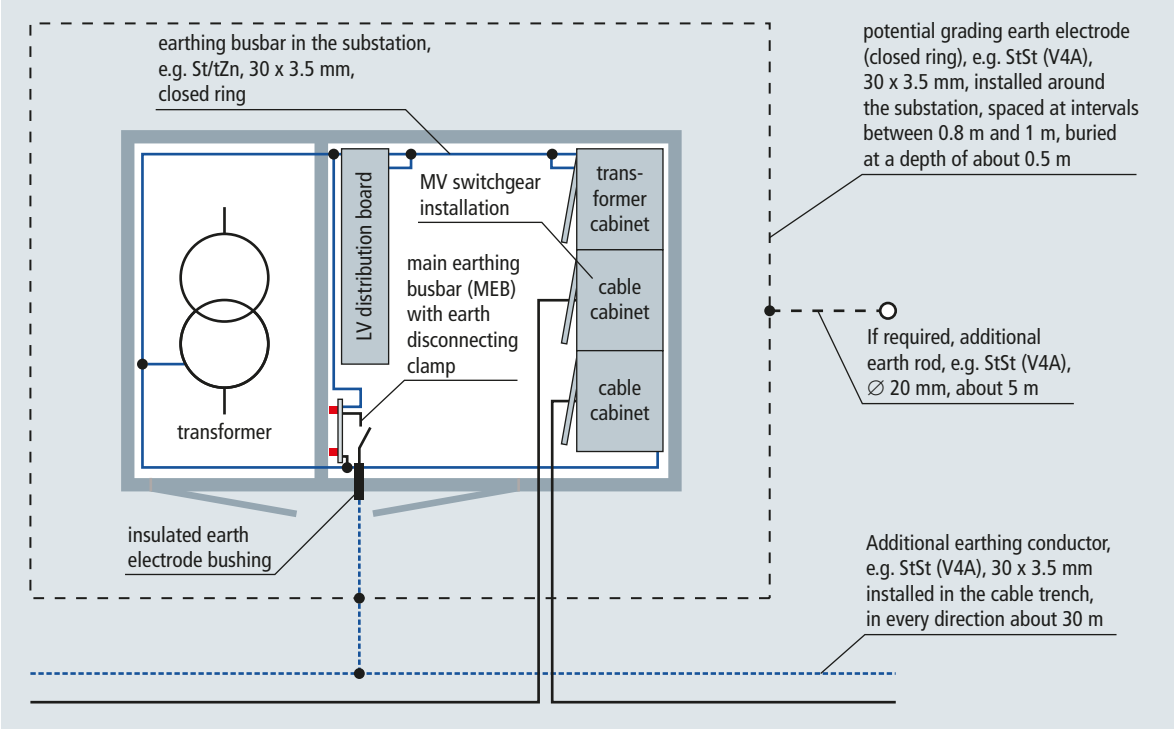

Figure 3 Schematic diagram of the earth-termination system of a transformer substation

about earth-termination systems have been pushed somewhat into the background. Properly functioning earth-termination systems are often taken as given. For this reason and due to the complexity of this topic, the most important physical and normative backgrounds, the correct dimensioning of earth-termination systems with regard to the current carrying capability and corrosion and technical solutions are described in a separate document based on a sample project as well as in chapter 5.9 of our Lightning Protection Guide.

Internal lightning protection measures

To protect the substation, secondary and telecontrol technology, the power supply must always be protected and, in case of cabled transmission of light-current signals, also the communication interface. The same applies to the transmission technology with external antennas where the only surges to be expected are due to the field effect of the lightning channel.

Protection of the lines at the transition from LPZ 0_A to LPZ1 and higher

To ensure safe operation of electrical and electronic devices, shielding against field-based interference and protection against conducted interference at the boundaries of the lightning protection zones (LPZs) must be ensured. To this end, surge protective devices that are capable of conducting high partial lightning currents without being destroyed must be installed at the transition from LPZ 0_A to LPZ 1 (lightning equipotential bonding). These surge protective devices are referred to as type 1 lightning current arresters and are tested with impulse currents of 10/350 µs waveform. At the transition from LPZ 0_B to LPZ 1 and higher low-energy impulse currents caused by voltages induced from the outside or surges generated in the system itself must be dealt with. These surge protective devices are referred to as type 2 surge arresters and are tested with impulse currents of 8/20 µs waveform.

According to the lightning protection zone concept, all incoming cables and lines have to be integrated in the lightning equipotential bonding system by means of type 1 lightning current arresters at the boundary from LPZ 0_A to LPZ 1 or from LPZ 0_A to LPZ 2. An additional local equipotential bonding system has to be established for every further zone boundary within the volume to be protected. This must integrate all cables and lines passing through this boundary. Type 2 surge arresters should be installed at the transition from LPZ 0_B to LPZ 1 and from LPZ 1 to LPZ 2, whereas type 3 surge arresters have to be provided at the transition from LPZ 2 to LPZ 3.

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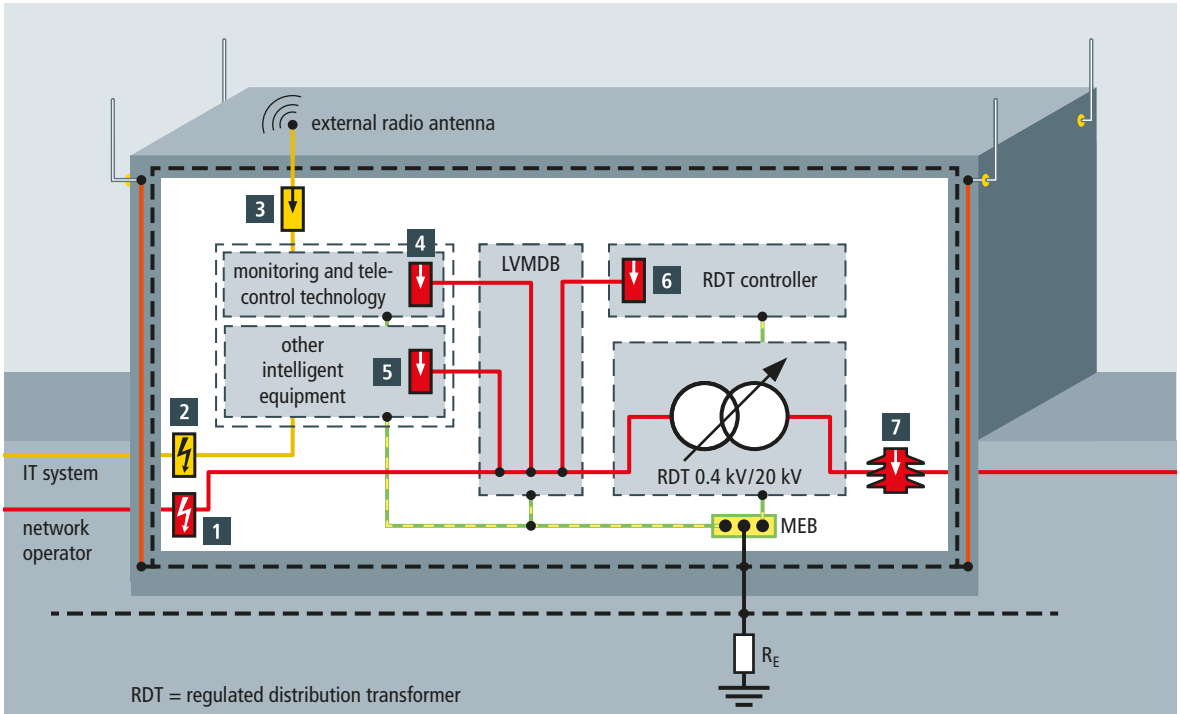
The function of type 2 and type 3 surge arresters is to further reduce the residual interference of the upstream protection stages and to limit the surges induced on the transformer substation or generated in the transformer substation. To ensure a consistent and suitable surge protection concept, the individual arrester types must be energy-coordinated.



	Area to be protected		Protective device	Part No.
1	Protection of the LVMDB		DEHNvenCI DVCI 1 255 FM	961 205
2	Protection of telecommunication systems	e.g. DIN rail mounted for SDSL	BLITZDUCTOR BXT ML4 BD HF 24 + Basisteil BXT BAS	920 375 + 920 300
		e.g. with LSA technology for SDSL	DEHNrapid LSA DRL 10 B 180 FSD + DEHNrapid LSA DRL HD 24 + DEHNrapid LSA EF 10 DRL	907 401 + 907 470 + 907 498
3	Protection of coaxial systems (e.g. for external antennas)		DEHNgate DGA G SMA DEHNgate DGA G BNC DEHNgate DGA G N	929 039 929 042 929 044
4	Protection of monitoring and telecontrol systems		DEHNguard DG S 275 FM DEHNrail DR M 2 P 255 FM	952 090 953 205
5	Protection of other intelligent equipment (e.g. data concentrators)		DEHNguard DG M TN 275 FM DEHNrail DR M 2 P 255 FM	952 205 953 205
6	Protection of the transformer (controller of the regulated distribution transformer)		DEHNguard DG SE H LI 275 FM DEHNguard M TN CI 275	952 930 952 173
7	Protection of the transformer		3 x DEHNmid DMI 30 10 1 L 3 x Disconnector DIC 10	990 010 994 003

Figure 4 Example of lightning and surge protection measures for an intelligent transformer substation

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Consequently, the following areas of power supply and information technology systems must be protected: Transformers / regulated distribution transformers, main low-voltage distribution board, monitoring and telecontrol systems, other intelligent equipment, etc. (**Figure 4**).

Selection of SPDs based on the voltage protection level (U_p) and the immunity of equipment

To describe the required voltage protection level Up in an LPZ, the immunity levels of the equipment within an LPZ must be defined, e.g. for power lines and connections of equipment according to IEC 61000-4-5 and IEC 60664-1, for telecommunication lines and connections of equipment according to IEC 61000-4-5, ITU-T K.20 and ITU-T K.21 and for other lines and connections of equipment according to the manufacturer's instructions. Manufacturers of electrical and electronic components or devices should be in the position to provide the required information about the immunity level according to the EMC standards. If this is not the case, the manufacturer of the transformer substation should perform tests to determine the immunity level. The defined immunity level of components in an LPZ directly defines the required voltage protection level for the LPZ boundaries. The immunity of a system must be proven, where applicable, with all SPDs installed and the equipment they are supposed to protect.

Protection of power supply systems

Due to the variety of substation types and designs (e.g., accessible and inaccessible (compact) substations) and the different possibilities of connecting the high-voltage and low-voltage side (overhead lines and buried cables), protection measures must be taken on a case-by-case basis.

Protection of the main low-voltage distribution board

To prevent galvanic coupling to the 20 kV medium-voltage overhead line network or outgoing low-voltage lines resulting from a lightning strike, a protective device must be installed in the main low-voltage distribution board. This device must be selected in such a way that it meets the requirements concerning the lightning current carrying capability, short-circuit withstand capability, follow current extinguishing capability and temporary overvoltages (TOV characteristic). To this end, a type 1 spark-gap-based combined arrester with integrated backup fuse (CI technology = Circuit Interruption Fuse integrated, see DEHNvenCI in **Figure 5**) can be used. The integrated backup fuse not only save spaces and installation time compared to a separate backup fuse, it is also adapted to the discharge capacity of the spark gap. This ensures maximum performance and incorrect installation is prevented.
Benefits of DEHNvenCI:

- Spark-gap-based combined arrester with integrated backup fuse (CI technology)
- Repeated discharge of lightning currents without destruction
- Wave breaker function, energy-coordinated
- Extinction of mains follow currents up to 100 kA
- Compared to varistors, galvanic isolation via the spark gap, this means no leakage current or ageing

As an alternative, type 1 lightning current arresters without CI technology such as DEHNbloc (**Figure 6**) can also be used.

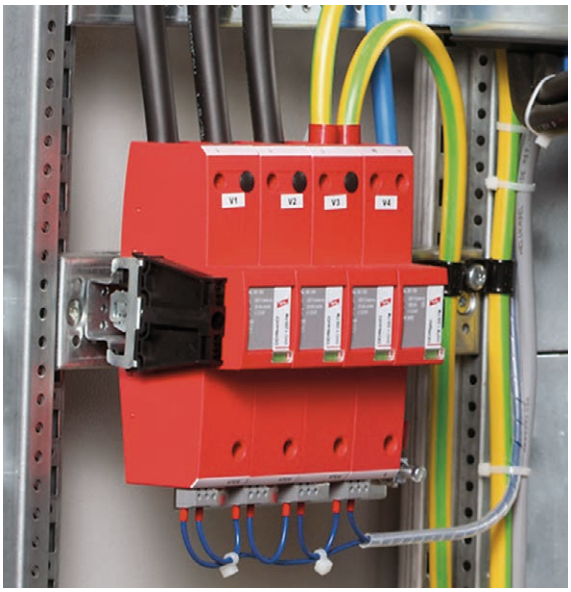

Figure 5 DEHNvenCI: spark-gap-based combined arrester with integrated backup fuse

Figure 6 DEHNbloc modular: coordinated spark-gap-based lightning current arrester

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Power supply (secondary technology)

If a risk analysis according to IEC 62305-2 reveals that only indirect lightning effects such as inductive / capacitive coupling or SEMP are to be expected for the secondary technology (electrical and electronic devices), type 2 (e.g. DEHNguard CI in the sub-distribution board, **Figure 7**) and type 3 (e.g. DEHNrail for protecting terminal equipment, **Figure 8**) surge arresters are sufficient. Type 2 arresters for the power supply are also available with the compact CI technology described above for restricted space conditions.

To implement a preventive maintenance concept, it is also possible to use a surge arrester with integrated LifeTime indication (DEHNguard SE H LI, **Figure 9**). This function allows pre-damage to be detected and the user is warned in good time before the surge protective device fails. This allows the arrester to be integrated in a condition monitoring system. Moreover, this version has a higher discharge capacity than standard type 2 arresters which ensures increased protection.

Since it is chiefly surges which are to be expected and a direct lightning strike to the substation building is unlikely, due to the above restrictions and the installation of the secondary technology directly in an intelligent transformer substation, type 2 and type 3 arresters are often sufficient. Based on the example of the 230 V power supply of the monitoring and telecontrol technology in separate housings in the intelligent transformer substation, this means that they need to be protected by further surge arresters, e.g. DEHNguard and DEHNrail.

In addition to the above-mentioned surge protection measures for protecting the secondary technology in an intelligent transformer substation, the transformer neutral point is directly earthed. This **clearly** distinguishes the place of installation "transformer substation" from other building installations. Possible interference pulses on the low-voltage side of the system are properly discharged via the transformer neutral point with low impedance earthing.

Protection of the transformer infeed / controller

The medium-voltage transformer infeed is protected by DEHNmid medium-voltage arresters, if required (**Figure 10**). These must be adapted to the system configuration of the medium-voltage network.

For regulated distribution transformers, there are also protection components for the power electronics which control the low-voltage side and protection components for control boxes which control the high-voltage side. In this case, type 2 arresters, e.g. DEHNguard are also typically used.

Protection of information and communication technology systems

Surge arresters for protecting electronic devices in signalling networks from the direct and indirect effects of lightning strikes and other transients are described in the IEC 61643-21

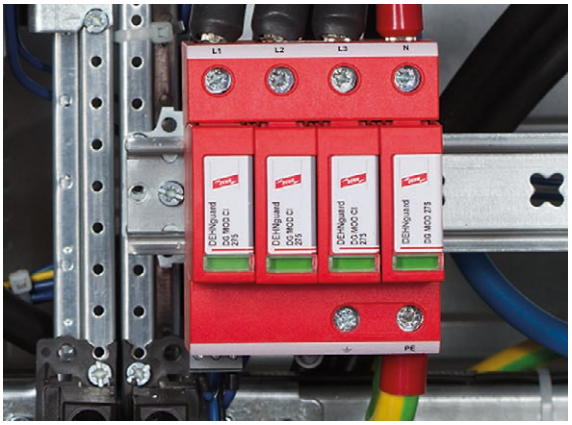

Figure 7 DEHNguard CI: modular surge arrester with integrated backup fuse

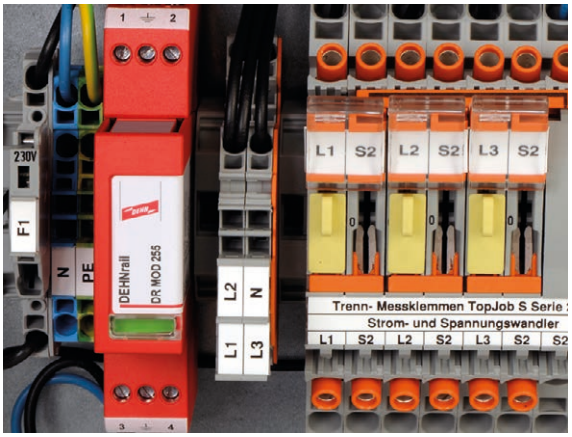

Figure 8 DEHNrail: type 3 surge arrester with high discharge capacity

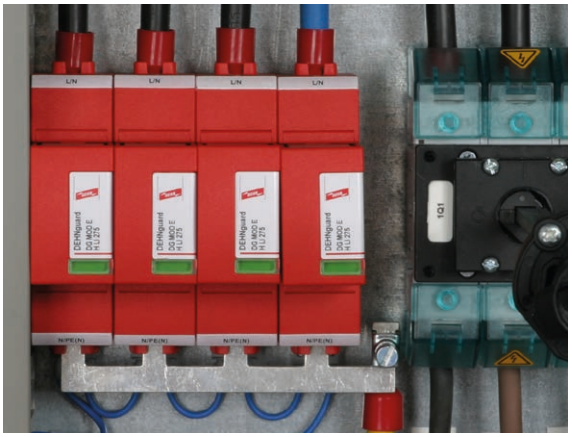

Figure 9 DEHNguard SE H LI = surge arrester with integrated "Lifetime Indication" early warning system

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Figure 10 DEHNmid: surge arrester for medium-voltage systems

Figure 11 DEHNgate DGA G: surge arrester with integrated gas discharge tube

standard and are installed at the zone boundaries according to the lightning protection zone concept. Multi-stage arresters must be designed without blind spots, in other words it must be ensured that the different protection stages are coordinated with one another. Otherwise, not all protection stages will be activated causing faults in the protective device. Information technology lines frequently enter the transformer substation via two-wire or coaxial glass fibre cables (power line communication (PLC)).

The glass fibre cables do not have to be protected by surge arresters since interference by an electromagnetic environment cannot occur unless the glass fibre cable has a metal sheath (e.g. rodent protection) which must then be integrated in the

Figure 12 BLITZDUCTOR: combined arrester with actiVsense technology and integrated LifeCheck monitoring

equipotential bonding either directly or by means of surge protective devices. The same applies to the PLC since the power line is typically already protected, thus ensuring undisturbed communication. In general, the following signal lines must be protected:

- Coaxial signal lines
- Signal lines for two-wire interfaces
- Remote signalling lines (e.g. 10 pair-cables for SDSL)

The DEHNgate arrester can be specifically used in wireless applications for coaxial device and antenna interfaces and is available with, e.g. SMA, BNC or N connection (**Figure 11**). The combined arrester from the BLITZDUCTOR series is a pluggable and universal multipole lightning current and surge arrester in the form of a terminal block for measuring and control, bus and telecommunication systems. It is particularly suited for installations and systems which require maximum availability (**Figure 12**).

The LifeCheck technology allows easy and fast arrester testing without removing the module. Integrated in the protection modules, LifeCheck permanently monitors the condition of the arrester. Like an early warning system, it detects imminent electrical and thermal overload of the protection components. The condition of the arrester can be read within a matter of seconds via contactless RFID technology using the portable DEHNcord LC arrester test device. Thanks to this innovative actiVsense technology, the arrester automatically detects the signal voltage in the range of 0 to 180 V and optimally adapts the voltage protection level to the currently applied signal. This makes the arrester suitable for applications where changing or slowly fluctuating signal levels (≤ 400 Hz) are to be expected.

The DEHNrapid LSA series is a modular system of lightning current, surge and combined arresters and can be used for telecommunication lines (e.g. 10 pairs). The arresters can be

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Figure 13 DEHNrapid LSA: lightning current / surge arrester for protecting the 10-pair telecommunication lines

plugged into LSA disconnection blocks of series 2 (**Figure 13**) and are thus easy to install. The LSA disconnection block function integrated in the lightning current arrester also provides protection during testing, disconnecting and patching.

Services

As a lightning and surge protection expert, DEHN offers protection solutions, but also equipment for safely controlling the risks posed by electricity. Our comprehensive portfolio is supplemented by numerous services.

- Test services in the DEHN test centre
- DEHNsupport Toolbox planning software
- Live working as a service
- Seminars and workshops of the DEHNacademy
- DEHNconcept planning service (e.g., correct dimensioning of earth-termination systems, risk analyses, planning of the external lightning protection system, etc.)
- Periodic inspections of earthing and short-circuiting devices, voltage detectors and insulating sticks
- Lightning Protection Guide (reference book), brochures and catalogues

In addition to theoretical considerations, the lightning current withstand capability and protective function of the overall systems and system components can also be tested in the company's in-house test laboratory. The DEHN test centre with a floor space of 800 m^2 is equipped with the latest devices and technologies for testing products as well as power supply installations and systems. With lightning currents up to 400 kA (10/350 µs), the test facility in the lightning current laboratory is one of the most powerful of its kind anywhere in the world. When it comes to services, DEHN is also a reliable partner who offers solutions from one source.

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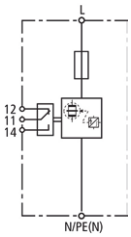
DEHNvenCI

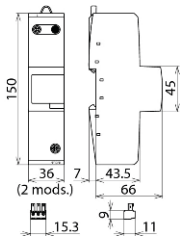
DVCI 1 255 FM (961 205)

- Spark-gap-based combined lightning current and surge arrester with integrated lightning current carrying backup fuse
- Maximum system availability due to RADAX Flow follow current limitation
- Capable of protecting terminal equipment

Figure without obligation



Basic circuit diagram DVCI 1 255 FM



Dimension drawing DVCI 1 255 FM

Combined lightning current and surge arrester with integrated lightning current carrying backup fuse.

Type Part No.	DVCI 1 255 FM 961 205
SPD according to EN 61643-11 / IEC 61643-11	type 1 + type 2 / class I + class II
Energy coordination with terminal equipment	type 1 + type 2
Energy coordination with terminal equipment (≤ 10 m)	type 1 + type 2 + type 3
Nominal voltage (a.c.) (U_N)	230 V (50 / 60 Hz)
Maximum continuous operating voltage (a.c.) (U_C)	255 V (50 / 60 Hz)
Lightning impulse current (10/350 µs) (I_{imp})	25 kA
Specific energy (W/R)	156.25 kJ/ohms
Nominal discharge current (8/20 µs) (I_n)	25 kA
Voltage protection level (U_P)	≤ 1.5 kV
Follow current extinguishing capability (a.c.) (I_{fi})	50 kA_{rms}
Follow current limitation / Selectivity	no tripping of a 20 A gG fuse up to 50 kA_{rms} (prosp.)
Response time (t_A)	≤ 100 ns
Max. mains-side overcurrent protection	not required
Rated breaking capacity of the internal backup protection	100 kA
Temporary overvoltage (TOV) (U_T) – Characteristic	440 V / 120 min. – withstand
Operating temperature range (T_U)	-40 °C ... +80 °C
Operating state / fault indication	green / red
Number of ports	1
Cross-sectional area (L, N/PE(N)) (min.)	10 mm^2 solid / flexible
Cross-sectional area (L, N/PE(N)) (max.)	50 mm^2 stranded / 35 mm^2 flexible
For mounting on	35 mm DIN rails acc. to EN 60715
Enclosure material	thermoplastic, red, UL 94 V-0
Place of installation	indoor installation
Degree of protection	IP 20
Capacity	2 module(s), DIN 43880
Approvals	KEMA
Type of remote signalling contact	changeover contact
Switching capacity (a.c.)	250 V / 0.5 A
Switching capacity (d.c.)	250 V / 0.1 A; 125 V / 0.2 A; 75 V / 0.5 A
Cross-sectional area for remote signalling terminals	max. 1.5 mm^2 solid / flexible
Extended technical data:	For use in switchgear installations with prospective short-circuit currents of more than 50 kA_{rms} (tested by the German VDE)
– Max. prospective short-circuit current	100 kA_{rms} (220 kA_{peak})
– Limitation / Extinction of mains follow currents	up to 100 kA_{rms} (220 kA_{peak})
Weight	435 g
Customs tariff number (Comb. Nomenclature EU)	85363090
GTIN	4013364145115
PU	1 pc(s)

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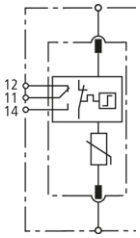
DEHNguard

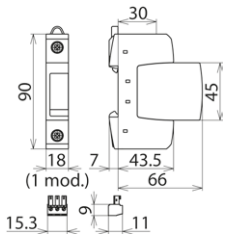
DG S 275 FM (952 090)

- Multi-purpose surge arrester consisting of a base element and a plug-in protection module
- High discharge capacity due to heavy-duty zinc oxide varistor
- High reliability due to "Thermo Dynamic Control" SPD monitoring device

Figure without obligation



Basic circuit diagram DG S 275 FM



Dimension drawing DG S 275 FM

Pluggable single-pole surge arrester consisting of a base part and a plug-in protection module; with floating remote signalling contact.

Type Part No.	DG S 275 FM 952 090
SPD according to EN 61643-11 / IEC 61643-11	type 2 / class II
Energy coordination with terminal equipment (≤ 10 m)	type 2 + type 3
Nominal voltage (a.c.) (U_N)	230 V (50 / 60 Hz)
Max. continuous operating voltage (a.c.) (U_C)	275V (50 / 60 Hz)
Max. continuous operating voltage (d.c.) (U_C)	350 V
Nominal discharge current (8/20 µs) (I_n)	20 kA
Max. discharge current (8/20 µs) (I_{max})	40 kA
Voltage protection level (U_P)	≤ 1.5 kV
Voltage protection level at 5 kA (U_P)	≤ 1 kV
Response time (t_A)	≤ 25 ns
Max. mains-side overcurrent protection	125 A gG
Short-circuit withstand capability for max. mains-side overcurrent protection (I_{SCCR})	50 kA_{rms}
Temporary overvoltage (TOV) (U_T) – Characteristic	335 V / 5 sec. – withstand
Temporary overvoltage (TOV) (U_T) – Characteristic	440 V / 120 min. – safe failure
Operating temperature range (T_U)	-40 °C ... +80 °C
Operating state / fault indication	green / red
Number of ports	1
Cross-sectional area (min.)	1.5 mm^2 solid / flexible
Cross-sectional area (max.)	35 mm^2 stranded / 25 mm^2 flexible
For mounting on	35 mm DIN rails acc. to EN 60715
Enclosure material	thermoplastic, red, UL 94 V-0
Place of installation	indoor installation
Degree of protection	IP 20
Capacity	1 module(s), DIN 43880
Approvals	KEMA, VDE, UL, CSA
Type of remote signalling contact	changeover contact
Switching capacity (a.c.)	250 V / 0.5 A
Switching capacity (d.c.)	250 V / 0.1 A; 125 V / 0.2 A; 75 V / 0.5 A
Cross-sectional area for remote signalling terminals	max. 1.5 mm^2 solid / flexible
Weight	119 g
Customs tariff number (Comb. Nomenclature EU)	85363030
GTIN	4013364108509
PU	1 pc(s)

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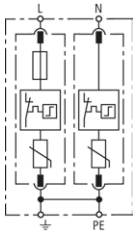
DEHNguard

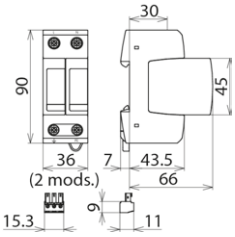
DG M TN CI 275 (952 173)

- Arrester backup fuse integrated in the protection module
- Prewired complete unit consisting of a base part and plug-in protection modules
- High reliability due to "Thermo Dynamic Control" SPD monitoring device

Figure without obligation



Basic circuit diagram DG M TN CI 275



Dimension drawing DG M TN CI 275

Modular surge arrester with integrated backup fuses for single-phase 230 V TN systems.

Type Part No.	DG M TN CI 275 952 173
SPD according to EN 61643-11 / IEC 61643-11	type 2 / class II
Energy coordination with terminal equipment (≤ 10 m)	type 2 + type 3
Nominal a.c. voltage (U_N)	230 V (50 / 60 Hz)
Max. continuous operating voltage (a.c.) (U_C)	275 V (50 / 60 Hz)
Nominal discharge current (8/20 µs) (I_n)	12.5 kA
Max. discharge current (8/20 µs) (I_{max})	25 kA
Voltage protection level [L-PE] / [N-PE] (U_P)	≤ 1.5 / ≤ 1.5 kV
Voltage protection level [L-PE] / [N-PE] at 5 kA (U_P)	≤ 1 / ≤ 1 kV
Response time (t_A)	≤ 25 ns
Max. mains-side overcurrent protection	not required
Rated breaking capacity of the internal backup protection	25 kA
Short-circuit withstand capability (I_{SCCR})	25 kA_{rms}
Temporary overvoltage (TOV) (U_T) – Characteristic	335 V / 5 sec. – withstand
Temporary overvoltage (TOV) (U_T) – Characteristic	440 V / 120 min. – safe failure
Operating temperature range (T_U)	-40 °C ... +80 °C
Operating state / fault indication	green / red
Number of ports	1
Cross-sectional area (min.)	1.5 mm^2 solid / flexible
Cross-sectional area (max.)	35 mm^2 stranded / 25 mm^2 flexible
For mounting on	35 mm DIN rails acc. to EN 60715
Enclosure material	thermoplastic, red, UL 94 V-0
Place of installation	indoor installation
Degree of protection	IP 20
Capacity	2 module(s), DIN 43880
Approvals	KEMA, VDE
Weight	257 g
Customs tariff number (Comb. Nomenclature EU)	85363030
GTIN	4013364128408
PU	1 pc(s)

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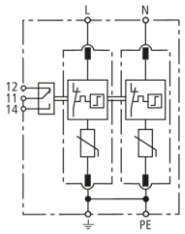
DEHNguard

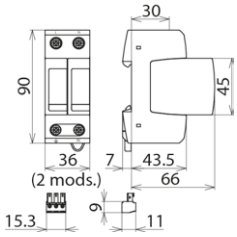
DG M TN 275 FM (952 205)

- Prewired complete unit consisting of a base part and plug-in protection modules
- High discharge capacity due to heavy-duty zinc oxide varistors / spark gaps
- High reliability due to "Thermo Dynamic Control" SPD monitoring device

Figure without obligation



Basic circuit diagram DG M TN 275 FM



Dimension drawing DG M TN 275 FM

Modular surge arrester for use in single-phase TN systems; with floating remote signalling contact.

Type Part No.	DG M TN 275 FM 952 205
SPD according to EN 61643-11 / IEC 61643-11	type 2 / class II
Energy coordination with terminal equipment (≤ 10 m)	type 2 + type 3
Nominal voltage (a.c.) (U_N)	230 V (50 / 60 Hz)
Max. continuous operating voltage (a.c.) (U_C)	275 V (50 / 60 Hz)
Nominal discharge current (8/20 µs) (I_n)	20 kA
Max. discharge current (8/20 µs) (I_{max})	40 kA
Voltage protection level [L-PE]/[N-PE] (U_P)	≤ 1.5 / ≤ 1.5 kV
Voltage protection level [L-PE] / [N-PE] at 5 kA (U_P)	≤ 1 / ≤ 1 kV
Response time (t_A)	≤ 25 ns
Max. mains-side overcurrent protection	125 A gG
Short-circuit withstand capability for max. mains-side overcurrent protection (I_{SCCR})	50 kA_{rms}
Temporary overvoltage (TOV) (U_T) – Characteristic	335 V / 5 sec. – withstand
Temporary overvoltage (TOV) (U_T) – Characteristic	440 V / 120 min. – safe failure
Operating temperature range (T_U)	-40 °C ... +80 °C
Operating state / fault indication	green / red
Number of ports	1
Cross-sectional area (min.)	1.5 mm^2 solid / flexible
Cross-sectional area (max.)	35 mm^2 stranded / 25 mm^2 flexible
For mounting on	35 mm DIN rails acc. to EN 60715
Enclosure material	thermoplastic, red, UL 94 V-0
Place of installation	indoor installation
Degree of protection	IP 20
Capacity	2 module(s), DIN 43880
Approvals	KEMA, VDE, UL
Type of remote signalling contact	changeover contact
Switching capacity (a.c.)	250 V / 0.5 A
Switching capacity (d.c.)	250 V / 0.1 A; 125 V / 0.2 A; 75 V / 0.5 A
Cross-sectional area for remote signalling terminals	max. 1.5 mm^2 solid / flexible
Weight	232 g
Customs tariff number (Comb. Nomenclature EU)	85363030
GTIN	4013364108400
PU	1 pc(s)

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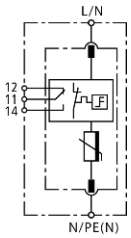
DEHNguard

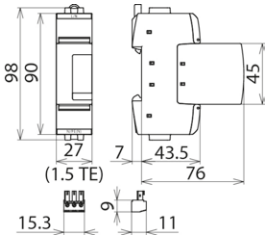
DG SE H LI 275 FM (952 930)

- Prewired single-pole surge arrester with clear "Lifetime Indication“: Three-step “Lifetime Indication“ (green-yellow-red) linked with a remote signalling contact
- Prompts the user in time <YELLOW> to replace the protection module in case of imminent arrester overload --> early warning system
- The arrester is operational without derating until the protection module is replaced and is thus suited for use in condition monitoring systems

Figure without obligation



Basic circuit diagram DG SE H LI 275 FM



Dimension drawing DG SE H LI 275 FM

Pluggable single-pole surge arrester with three-step early warning system (green-yellow-red) comprising a base part and a plug-in protection module.

Type Part No.	DG SE H LI 275 FM 952 930
SPD according to EN 61643-11 / IEC 61643-11	type 2 / class II
Energy coordination with terminal equipment (≤ 10 m)	type 2 + type 3
Nominal voltage (a.c.) (U_N)	230 V (50 / 60 Hz)
Max. continuous operating voltage (a.c.) (U_C)	275 V (50 / 60 Hz)
Nominal discharge current (8/20 µs) (I_n)	30 kA
Max. discharge current (8/20 µs) (I_{max})	65 kA
Voltage protection level (U_P)	≤ 1.5 kV
Voltage protection level at 5 kA (U_P)	≤ 1 kV
Response time (t_A)	≤ 25 ns
Max. mains-side overcurrent protection	125 A gG
Short-circuit withstand capability for max. mains-side overcurrent protection (I_{SCCR})	50 kA_{rms}
Temporary overvoltage (TOV) (U_T) – Characteristic	335 V / 5 sec. – withstand
Temporary overvoltage (TOV) (U_T) – Characteristic	440 V / 120 min. – safe failure
Operating temperature range (T_U)	-40 °C ... +80 °C
Operating state / fault indication	green / yellow / red
Remote signalling	activated in case of yellow indication
Number of ports	1
Cross-sectional area (min.)	1.5 mm^2 solid / flexible
Cross-sectional area (max.)	35 mm^2 stranded / 25 mm^2 flexible
For mounting on	35 mm DIN rails acc. to EN 60715
Enclosure material	thermoplastic, red, UL 94 V-0
Place of installation	indoor installation
Degree of protection	IP20
Capacity	1.5 module(s), DIN 43880
Type of remote signalling contact	changeover contact
Switching capacity (a.c.)	250 V / 0.5 A
Switching capacity (d.c.)	250 V / 0.1 A; 125 V / 0.2 A; 75 V / 0.5 A
Cross-sectional area for remote signalling terminals	max. 1.5 mm^2 solid / flexible
Weight	171 g
Customs tariff number (Comb. Nomenclature EU)	85363030
GTIN	4013364158559
PU	1 pc(s)

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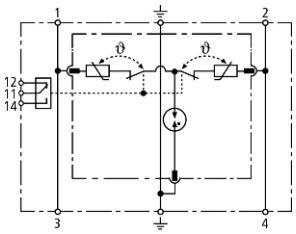
DEHNrail

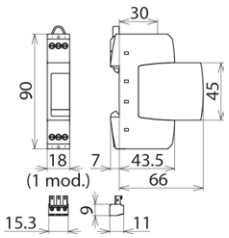
DR M 2P 255 FM (953 205)

- Two-pole surge arrester consisting of a base part and a plug-in protection module
- High discharge capacity due to heavy-duty zinc oxide varistor / spark gap combination
- Energy coordination with other arresters of the Red/Line product family

Figure without obligation



Basic circuit diagram DR M 2P 255 FM



Dimension drawing DR M 2P 255 FM

Two-pole surge arrester consisting of a base part and a plug-in protection module; with floating remote signalling contact.

Type Part No.	DR M 2P 255 FM 953 205
SPD according to EN 61643-11 / IEC 61643-11	type 3 / class III
Nominal voltage (a.c.) (U_N)	230 V (50 / 60 Hz)
Max. continuous operating voltage (a.c.) (U_C)	255 V (50 / 60 Hz)
Max. continuous operating voltage (d.c.) (U_C)	255 V
Nominal load current (a.c.) (I_L)	25 A
Nominal discharge current (8/20 µs) (I_n)	3 kA
Total discharge current (8/20 µs) [L+N-PE] (I_{total})	5 kA
Combination wave (U_{OC})	6 kV
Combination wave [L+N-PE] ($U_{OC\ total}$)	10 kV
Voltage protection level [L-N] / [L/N-PE] (U_P)	≤ 1250 / ≤ 1500 V
Response time [L-N] (t_A)	≤ 25 ns
Response time [L/N-PE] (t_A)	≤ 100 ns
Max. mains-side overcurrent protection	25 A gG or B 25 A
Short-circuit withstand capability for mains-side overcurrent protection with 25 A gG (I_{SCCR})	6 kA_{rms}
Temporary overvoltage (TOV) [L-N] (U_T) – Characteristic	335 V / 5 sec. – withstand
Temporary overvoltage (TOV) [L-N] (U_T) – Characteristic	440 V / 120 min. – safe failure
Temporary overvoltage (TOV) [L/N-PE] (U_T) – Characteristic	335 V / 120 min. – withstand
Temporary overvoltage (TOV) [L/N-PE] (U_T) – Characteristic	440 V / 5 sec. – withstand
Temporary overvoltage (TOV) [L+N-PE] (U_T) – Characteristic	1200 V + U_{REF} / 200 ms – safe failure
Operating temperature range (T_U)	-40 °C ... +80 °C
Operating state / fault indication	green / red
Number of ports	1
Cross-sectional area (min.)	0.5 mm^2 solid / flexible
Cross-sectional area (max.)	4 mm^2 solid / 2.5 mm^2 flexible
For mounting on	35 mm DIN rails acc. to EN 60715
Enclosure material	thermoplastic, red, UL 94 V-0
Place of installation	indoor installation
Degree of protection	IP 20
Capacity	1 module(s), DIN 43880
Approvals	KEMA, VDE, UL, CSA
Type of remote signalling contact	changeover contact
Switching capacity (a.c.)	250 V / 0.5 A
Switching capacity (d.c.)	250 V / 0.1 A; 125 V / 0.2 A; 75 V / 0.5 A
Cross-sectional area for remote signalling terminals	max. 1.5 mm^2 solid / flexible
Weight	84 g
Customs tariff number (Comb. Nomenclature EU)	85363030
GTIN	4013364108318
PU	1 pc(s)

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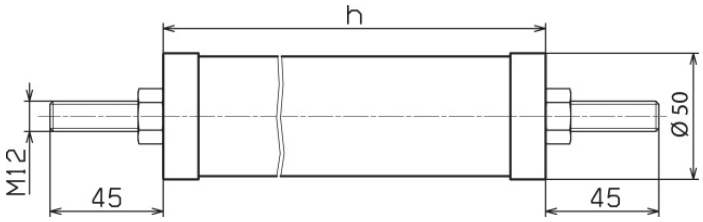
DEHNmid

DMI 30 10 1 L (990 010)

Figure without obligation



Dimension drawing DMI 30 10 1 L

Type Part No.	DMI 30 10 1 L 990 010
Nominal discharge current (8/20 µs) (I_n)	10 kA
High current impulse (4/10 µs)	100 kA
Overload capacity	20 kA
Line discharge class (1)	1 (2.8 kJ/kV $_{Ur}$)
Long-duration current impulse (1)	250 A / 2000 µs
Line discharge class (2)	2 (4.5 kJ/kV $_{Ur}$)
Long-duration current impulse (2)	500 A / 2000 µs
Rated voltage (a.c.) (U_r)	30 kV
Continuous operating voltage (a.c.) (MCOV) (U_C)	24.0 kV
Temporary overvoltage (TOV) at 1 sec. (U_{1s})	34,5 kV
Temporary overvoltage (TOV) at 10 sec. (U_{10s})	32.7 kV
Residual voltage at 10 kA (1/2 µs) ($\hat{u}_{res}$)	85.6 kV
Residual voltage at 5 kA (8/20 µs) ($\hat{u}_{res}$)	74.4 kV
Residual voltage at 10 kA (8/20 µs) ($\hat{u}_{res}$)	80.0 kV
Residual voltage at 20 kA (8/20 µs) ($\hat{u}_{res}$)	88.8 kV
Residual voltage at 40 kA (8/20 µs) ($\hat{u}_{res}$)	100.0 kV
Residual voltage at 125 A (40/100 µs) ($\hat{u}_{res}$)	58.4 kV
Residual voltage at 250 A (40/100 µs) ($\hat{u}_{res}$)	60.2 kV
Residual voltage at 500 A (40/100 µs) ($\hat{u}_{res}$)	62.4 kV
Residual voltage at 1000 A (40/100 µs) ($\hat{u}_{res}$)	64.8 kV
Residual voltage at 2000 A (40/100 µs) ($\hat{u}_{res}$)	68.0 kV
Insulation of arrester housing / nominal power frequency withstand voltage (dry) (U_{PFWL})	84 kV
Insulation of arrester housing / nominal lightning withstand voltage (U_{LIWL})	122 kV
Height (h)	254 mm
Creepage distance (+/- 5%)	230 mm
Torsional strength	78 Nm
Maximum permissible dynamic service load (MPDSL)	230 Nm
Tensile strength	1400 N
Ambient temperature (T_A)	-40 °C ... +55 °C
Altitude	up to 1000 m above sea level
Power frequency (f_N)	16-62 Hz
Housing material	HTV silicone housing
Colour	auburn, RAL 3013
Fittings	terminals, screws and nuts of stainless steel
Conductor clamp	up to Ø16 mm
Test standards	IEC 60099-4
Weight	2,1 kg
Customs tariff number (Comb. Nomenclature EU)	85354000
GTIN	4013364102675
PU	1 pc(s)

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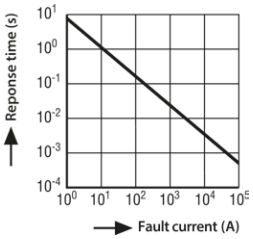
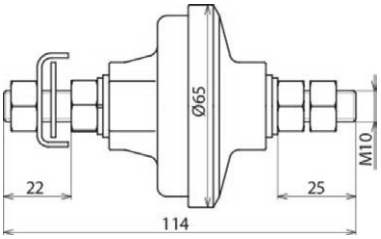
Disconnector

DIC 10 (994 003)

Figure without obligation





Dimension drawing DIC 10

Type Part No.	DIC 10 994 003
Weight	0.18 kg
Ambient temperature (T_U)	-40 °C ... +55 °C
Altitude	3000 m above sea level
Power frequency (f_N)	48-62 Hz
Housing material	ultraviolet-resistant low-pressure polyethylene
Colour	green
Fittings	stainless steel screws and nuts
Conductor clamp	up to Ø12 mm
Weight	180 g
Customs tariff number (Comb. Nomenclature EU)	85389099
GTIN	4013364103146
PU	1 pc(s)

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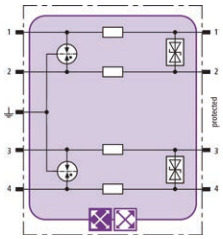
BLITZDUCTOR XT

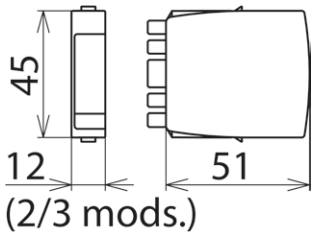
BXT ML4 BD HF 24 (920 375)

- LifeCheck SPD monitoring function
- Minimal signal interference
- For installation in conformity with the lightning protection zone concept at the boundaries from 0_A –2 and higher

Figure without obligation



Basic circuit diagram BXT ML4 BD HF 24



Dimension drawing BXT ML4 BD HF 24

Space-saving combined lightning current and surge arrester module with LifeCheck feature for protecting two pairs of high-frequency bus systems or video transmission systems. If LifeCheck detects thermal or electrical overload, the arrester has to be replaced. This status is indicated contactlessly by the DEHNrecord LC / SCM / MCM reader.

Type Part No.	BXT ML4 BD HF 24 920 375
SPD monitoring system	LifeCheck
SPD class	TYPE 1 P1
Nominal voltage (U_N)	24 V
Max. continuous operating voltage (d.c.) (U_C)	33 V
Max. continuous operating voltage (a.c.) (U_C)	23.3 V
Nominal current at 45 °C (I_L)	1.0 A
D1 Total lightning impulse current (10/350 µs) (I_{imp})	10 kA
D1 Lightning impulse current (10/350 µs) per line (I_{imp})	2.5 kA
C2 Total nominal discharge current (8/20 µs) (I_n)	20 kA
C2 Nominal discharge current (8/20 µs) per line (I_n)	10 kA
Voltage protection level line-line for I_{imp} D1 (U_p)	≤ 65 V
Voltage protection level line-PG for I_{imp} D1 (U_p)	≤ 550 V
Voltage protection level line-line at 1 kV/µs C3 (U_p)	≤ 47 V
Voltage protection level line-PG at 1 kV/µs C3 (U_p)	≤ 550 V
Series resistance per line	1.0 ohm(s)
Cut-off frequency line-line (f_G)	100.0 MHz
Capacitance line-line (C)	≤ 25 pF
Capacitance line-PG (C)	≤ 16 pF
Operating temperature range (T_U)	-40 °C ... +80 °C
Degree of protection (with plugged-in protection module)	IP 20
Pluggable into	BXT BAS / BSP BAS 4 base part
Earthing via	BXT BAS / BSP BAS 4 base part
Enclosure material	polyamide PA 6.6
Colour	yellow
Test standards	IEC 61643-21 / EN 61643-21, UL 497B
Approvals	CSA, UL, EAC, ATEX, IECEx, CSA & USA Hazloc, SIL
SIL classification	up to SIL3 *)
ATEX approvals	DEKRA 11ATEX0089 X: II 3 G Ex nA IIC T4 Gc
IECEx approvals	DEK 11.0032X: Ex nA IIC T4 Gc
CSA & USA Hazloc approvals (1)	2516389: Class I Div. 2 GP A, B, C, D T4
CSA & USA Hazloc approvals (2)	2516389: Class I Zone 2, AEx nA IIC T4
Weight	24 g
Customs tariff number (Comb. Nomenclature EU)	85363010
GTIN	4013364109100
PU	1 pc(s)

*) For more detailed information, please visit www.dehn-international.com.

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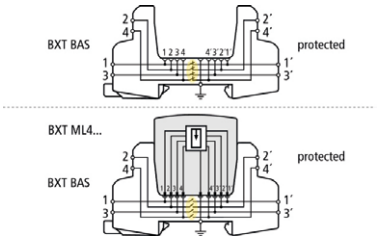
BLITZDUCTOR XT

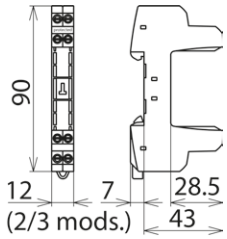
BXT BAS (920 300)

- Four-pole version for universal use with all types of BSP and BXT / BXTU protection modules
- No signal interruption if the protection module is removed
- Universal design without protection elements

Figure without obligation



Basic circuit diagram with and without plugged-in module



Dimension drawing BXT BAS

The BLITZDUCTOR XT base part is an extremely space-saving and universal four-pole feed-through terminal for the insertion of a protection module without signal disconnection if the protection module is removed. The snap-in mechanism at the supporting foot of the base part allows the protection module to be safely earthed via the DIN rail. Since no components of the protective circuit are situated in the base part, maintenance is only required for the protection modules.

Type Part No.	BXT BAS 920 300
Operating temperature range (T_U)	-40 °C ... +80 °C
Degree of protection	IP 20
For mounting on	35 mm DIN rails acc. to EN 60715
Connection (input / output)	screw / screw
Signal disconnection	no
Cross-sectional area, solid	0.08-4 mm^2
Cross-sectional area, flexible	0.08-2.5 mm^2
Tightening torque (terminals)	0.4 Nm
Earthing via	35 mm DIN rails acc. to EN 60715
Enclosure material	polyamide PA 6.6
Colour	yellow
ATEX approvals	DEKRA 11ATEX0089 X: II 3 G Ex nA IIC T4 Gc *)
IECEx approvals	DEK 11.0032X: Ex nA IIC T4 Gc *)
Approvals	CSA, UL, EAC, ATEX, IECEx *)
Weight	34 g
Customs tariff number (Comb. Nomenclature EU)	85369010
GTIN	4013364109179
PU	1 pc(s)

*) only in connection with an approved protection module

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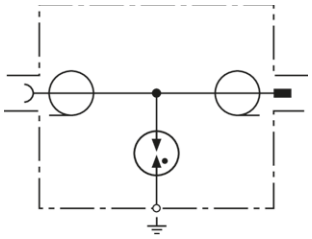
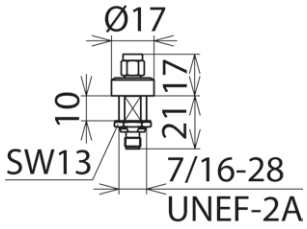
DGA G SMA (929 039)

- Compact dimensions
- Extremely wide transmission range
- For installation in conformity with the lightning protection zone concept at the boundaries from 0_B – 1 and higher

Figure without obligation



Basic circuit diagram DGA G SMA



Dimension drawing DGA G SMA

Surge arrester for remote supply with integrated gas discharge tube. Ideally suited for wireless applications for the coaxial interfaces of devices and antennas.
Available with SMA, BNC or N connection for bushing installation.

Type Part No.	DGA G SMA 929 039
SPD class	TYPE 2
Max. continuous operating voltage (d.c.) (U_C)	135 V
Nominal current (I_L)	2 A
Max. transmission capacity	60 W
D1 Lightning impulse current (10/350 µs) (I_{imp})	1 kA
C2 Nominal discharge current (8/20 µs) (I_n)	5 kA
Voltage protection level for I_n C2 (U_P)	≤ 700 V
Frequency range	0-5.8 GHz
Insertion loss	≤ 0.2 dB
Return loss (d.c. - 3 GHz)	≥ 20 dB
Return loss (3 GHz-5.8 GHz)	≥ 18 dB
Characteristic impedance (Z)	50 ohms
Operating temperature range (T_U)	-40 °C ... +85 °C
Degree of protection (if lines are connected)	IP 65
Connection	SMA socket / SMA plug
Earthing via	bushing (Ø11.2 mm)
Enclosure material	gold-plated brass
Colour	gold
Test standards	IEC 61643-21 / EN 61643-21
Weight	24 g
Customs tariff number (Comb. Nomenclature EU)	85366910
GTIN	4013364135185
PU	1 pc(s)

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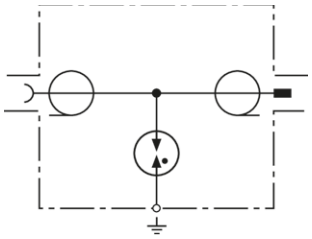
DEHNgate

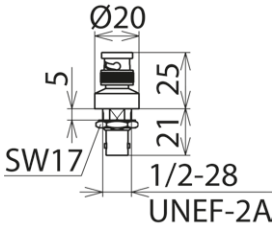
DGA G BNC (929 042)

- Compact dimensions
- Extremely wide transmission range
- For installation in conformity with the lightning protection zone concept at the boundaries from 0_B – 1 and higher

Figure without obligation



Basic circuit diagram DGA G BNC



Dimension drawing DGA G BNC

Surge arrester for remote supply with integrated gas discharge tube. Ideally suited for wireless applications for the coaxial interfaces of devices and antennas.
Available with SMA, BNC or N connection for bushing installation.

Type Part No.	DGA G BNC 929 042
SPD class	TYPE 2
Max. continuous operating voltage (d.c.) (U_C)	135 V
Nominal current (I_L)	3.5 A
Max. transmission capacity	25 W
D1 Lightning impulse current (10/350 µs) (I_{imp})	1 kA
C2 Nominal discharge current (8/20 µs) (I_n)	5 kA
Voltage protection level for I_n C2 (U_P)	≤ 650 V
Frequency range	0-4 GHz
Insertion loss	≤ 0.2 dB
Return loss (d.c. - 3 GHz)	≥ 20 dB
Return loss (3 GHz-4 GHz)	≥ 20 dB
Characteristic impedance (Z)	50 ohms
Operating temperature range (T_U)	-40 °C ... +85 °C
Degree of protection (if lines are connected)	IP 20
Connection	BNC socket / BNC plug
Earthing via	bushing (Ø12.9 mm)
Enclosure material	brass, gold-plated
Colour	gold
Test standards	IEC 61643-21 / EN 61643-21
Weight	39 g
Customs tariff number (Comb. Nomenclature EU)	85366910
GTIN	4013364091030
PU	1 pc(s)

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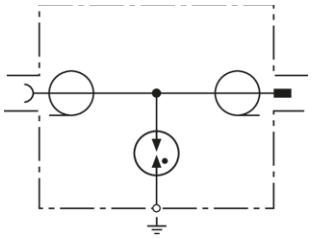
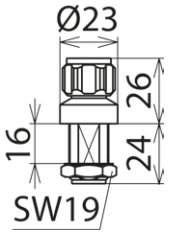
DGA G N (929 044)

- Compact dimensions
- Extremely wide transmission range
- For installation in conformity with the lightning protection zone concept at the boundaries from 0_B – 1 and higher

Figure without obligation



Basic circuit diagram DGA G N



Dimension drawing DGA G N

Surge arrester for remote supply with integrated gas discharge tube. Ideally suited for wireless applications for the coaxial interfaces of devices and antennas.
Available with SMA, BNC or N connection for bushing installation.

Type Part No.	DGA G N 929 044
SPD class	TYPE 2
Max. continuous operating voltage (d.c.) (U_C)	135 V
Nominal current (I_L)	6 A
Max. transmission capacity	60 W
D1 Lightning impulse current (10/350 µs) (I_{imp})	1 kA
C2 Nominal discharge current (8/20 µs) (I_n)	5 kA
Voltage protection level for I_n C2 (U_P)	≤ 650 V
Frequency range	0-5.8 GHz
Insertion loss	≤ 0.2 dB
Return loss (d.c. - 5.6 GHz)	≥ 20 dB
Return loss (5.6 GHz-5.8 GHz)	≥ 18.5 dB
Characteristic impedance (Z)	50 ohms
Operating temperature range (T_U)	-40 °C ... +85 °C
Degree of protection (if lines are connected)	IP 65
Connection	N socket / N plug
Earthing via	bushing (Ø16.2 mm)
Enclosure material	brass, gold-plated
Colour	gold
Test standards	IEC 61643-21 / EN 61643-21
Weight	86 g
Customs tariff number (Comb. Nomenclature EU)	85366910
GTIN	4013364091054
PU	1 pc(s)

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DEHNrapid LSA

DRL 10 B 180 FSD (907 401)

- Lightning current arrester for use as plug-in SPD block with integrated LSA disconnection block function
- Visual fault indicator of the gas discharge tubes
- Can be combined to a combined lightning current and surge arrester by means of a DRL protective plug
- For installation in conformity with the lightning protection zone concept at the boundaries from 0_A –1 and higher

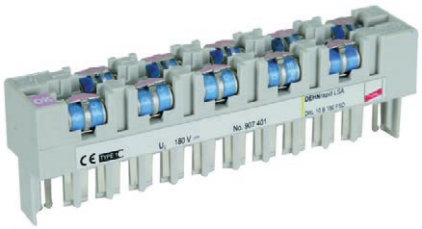
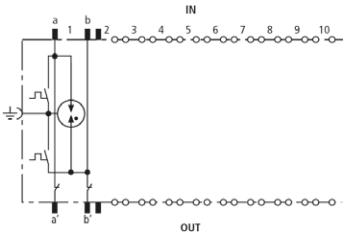
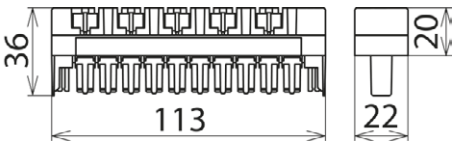


Figure without obligation



Basic circuit diagram DRL 10 B 180 FSD



Dimension drawing DRL 10 B 180 FSD

Lightning current carrying DRL plug-in SPD block (10 pairs) for almost all applications. Expandable to a combined lightning current and surge arrester by means of a DRL protective plug. The integrated disconnection block contacts allow testing, measuring and patching with plugged-in protection. The three-pole gas discharge tubes have a fail-safe function with visual fault indicator.

Type Part No.	DRL 10 B 180 FSD 907 401
SPD class	TYPE 1 C
Fault indication	visual, colour change
Nominal voltage (U_N)	180 V
Max. continuous operating voltage (d.c.) (U_C)	180 V
Max. continuous operating voltage (a.c.) (U_C)	127 V
Nominal current (I_L)	0.4 A
D1 Total lightning impulse current (10/350 µs) (I_{imp})	5 kA
D1 Lightning impulse current (10/350 µs) per line (I_{imp})	2.5 kA
C2 Total nominal discharge current (8/20 µs) (I_n)	10 kA
C2 Nominal discharge current (8/20 µs) per line (I_n)	5 kA
Voltage protection level line-line for I_{imp} D1 (U_p)	≤ 500 V
Voltage protection level line-PG for I_{imp} D1 (U_p)	≤ 500 V
Voltage protection level line-line at 1 kV/µs C3 (U_p)	≤ 500 V
Voltage protection level line-PG at 1 kV/µs C3 (U_p)	≤ 450 V
Series resistance per line	≤ 0.005 ohms
Capacitance line-line (C)	≤ 5 pF
Capacitance line-PG (C)	≤ 5 pF
Fail-safe function	gas discharge tube with spring contacts
Operating temperature range (T_U)	-40 °C ... +80 °C
Degree of protection	IP 10
Plugs into	LSA disconnection block 2/10
Earthing via	mounting frame
Enclosure material	polyamide PA 6.6
Colour	grey
Test standards	IEC 61643-21 / EN 61643-21
Approvals	EAC
Weight	69 g
Customs tariff number (Comb. Nomenclature EU)	85363010
GTIN	4013364107564
PU	1 pc(s)

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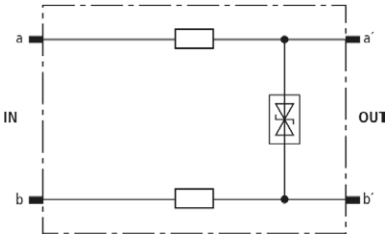
DEHNrapid LSA

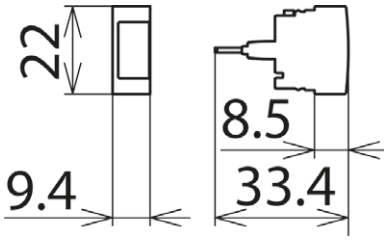
DRL HD 24 (907 470)

- For maximum transmission rates
- Energy-coordinated with DRL plug-in SPD block
- For installation in conformity with the lightning protection zone concept at the boundaries from 1 – 2 and higher

Figure without obligation



Basic circuit diagram DRL HD 24



Dimension drawing DRL HD 24

Protective plug (one pair), energy-coordinated with DRL plug-in SPD block, for use as single-stage protective device for terminal equipment for high-frequency transmissions such as G.703 or ISDN $U_{2m,}$ S_{2m} and $S_{0.}$ To be mounted into EF 10 DRL. Installation recommended only in combination with DRL plug-in SPD block.

Type Part No.	DRL HD 24 907 470
SPD class	TYPE 3 P1
Nominal voltage (U_N)	24 V
Max. continuous operating voltage (d.c.) (U_C)	28 V
Max. continuous operating voltage (a.c.) (U_C)	19.5 V
Nominal current (I_L)	0.4 A
D1 Total lightning impulse current (10/350 µs) in combination with DRL 10 B... (I_{imp})	5 kA
D1 Lightning impulse current (10/350 µs) per line in combination with DRL 10 B... (I_{imp})	2.5 kA
C2 Total nominal discharge current (8/20 µs) in combination with DRL 10 B... (I_n)	10 kA
C2 Nominal discharge current (8/20 µs) per line in combination with DRL 10 B... (I_n)	5 kA
C1 Nominal discharge current (8/20 µs) per line without DRL 10 B... (I_n)	0.5 kA
Voltage protection level line-PG for I_{imp} D1 in combination with DRL 10 B... (U_p)	≤ 500 V
Voltage protection level line-line at 1 kV/µs C3 (U_p)	≤ 46 V
Series resistance per line	4.7 ohms
Cut-off frequency line-line (f_G)	94 MHz
Capacitance line-line (C)	≤ 22 pF
Operating temperature range (T_U)	-40 °C ... +80 °C
Degree of protection	IP 20 (when plugged in)
Plugs into	LSA disconnection block 2/10 or DRL 10 B... plug-in SPD block
Enclosure material	polyamide PA 6.6
Colour	yellow
Test standards	IEC 61643-21 / EN 61643-21
Approvals	EAC
Weight	4 g
Customs tariff number (Comb. Nomenclature EU)	85363010
GTIN	4013364107663
PU	10 pc(s)

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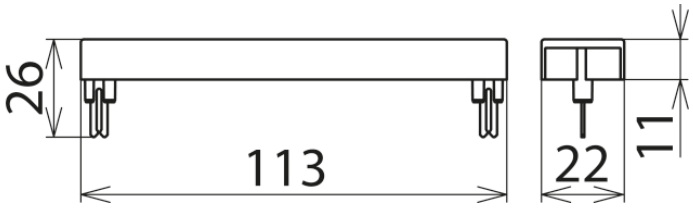
DEHNrapid LSA

EF 10 DRL (907 498)

Figure without obligation



Dimension drawing EF 10 DRL

Snap-on earthing frame for earthing and installation of max. 10 DRL protective plugs. Plugs into a 10-pair disconnection block or DRL plug-in SPD block.

Type Part No.	EF 10 DRL 907 498
Plugs into	LSA disconnection blocks or DRL plug-in SPD block
Earthing via	mounting frame or DRL plug-in SPD block
Enclosure material	polyamide PA 6.6
Colour	yellow
Weight	10 g
Customs tariff number (Comb. Nomenclature EU)	85389099
GTIN	4013364107540
PU	1 pc(s)

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Lightning Protection
Safety Equipment
DEHN protects.

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